

**REMARKS**

Claims 3-4 are pending in the present application. Claims 1-2 are herein cancelled. No new matter has been entered.

**Rejections under 35 USC §112, First Paragraph**

**Claims 1 and 2 are rejected under 35 U.S.C. 112, first paragraph, because the specification does not reasonably provide enablement for the sintered body consisting essentially of diamond powder having grain size of 100 nm or less.**

By this amendment, claims 1-2 have been cancelled. Applicants respectfully submit that the rejection is now moot.

**Rejections under 35 USC §103(a)**

**Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hiraki (U.S. Patent No. 6,337,060) in view of Sundback (U.S. Patent No. 5,047,182) in view of Slutz (EP 0 482 372) in view of Yazu (U.S. Patent No. 4,610,699).**

By this amendment, claims 1-2 have been cancelled. Applicants respectfully submit that the rejection is now moot.

**Claims 3-4 were rejected under 35 USC 103(a) as being obvious over Hiraki (U.S. Patent No. 6,337,060) in view of Sundback (U.S. Patent No. 5,047,182) in view of Slutz (EP 0 482 372) as in claims 1 and 2, in view of Yazu (U.S. Patent No. 4,610,699).**

However, none of the references disclose sintering of “ultrafine-grain **natural diamond** powder having a grading range of **zero to 0.1  $\mu\text{m}$ .**” The ultrafine-grain diamond powder is of the size of viruses, which cannot be seen without using an electron microscope. It should be noted the ultrafine-grain diamond powder is of **natural diamond**. Hiraki and Yazu discuss solution of problems peculiar to artificial diamond but they do not discuss the ultrafine-grain diamond powder of natural diamond.

Responding to Applicants’ previous response, the Examiner alleged as follows:

Applicant argues that it would not have been obvious to combine the teachings of Slutz with Hiraki and Sundback. However, Slutz teaches a sintering process using diamond and a substance similar to diamond (polycrystalline CBN) in a process where the product is thermally stable and dense. Therefore, one of ordinary skill in the art at the time of the invention would combine these teachings. In addition, Yazu teaches a process using a reaction vessel (capsule) with diamond and no traditional sintering aid where the product is more heat resistant, a useful property if the diamond is to be used as an abrasive or will be exposed to high temperatures.

(Office Action, page 5, lines 12-19). However, the Examiner merely discusses what is written in the references and jumps to a conclusion that “one of ordinary skill in the art at the time of the invention would combine these teachings.” The Examiner has not given the reason why a person of ordinary skill in the art would combine or modify the teachings of the references. The

Supreme Court in KSR noted that the **analysis supporting a rejection** under 35 U.S.C. 103 **has to be made explicit**. Thus, the rejection has not established a prima facie case of obviousness.

In rejecting claim 1, the Examiner alleged as follows:

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the diamond particles of Hiraki with the freeze-drying of Sundback and the process of sintering without a sintering aid of Slutz because Sundback teaches that freeze drying can be used with a variety of inorganic powders because freeze drying can overcome thermal drying stresses which would be destructive. Additionally, an ostensible "freeze-drying" process allows for capillary forces between the inorganic particles, thereby pulling them together during drying to yield a denser, smoother surface (col. 3, lines 25-37; col. 3, lines 58-66).

(Office Action, page 3, line 18 to page 4, line).

As the Examiner admits, Hiraki does not teach freeze-drying or sintering without a sintering aid. Hiraki discloses fine particles of **hydrophilic** diamond which can effectively provide a single layer of particles when used in lubrication, surface modification, abrasive applications, etc. Moreover, Hiraki does not teach or suggest sintering of diamond powder. The Examiner does not give the reason why a person having ordinary skill in the art would sinter Hiraki's fine particles of **hydrophilic** diamond which effectively provide a single layer of particles when used in lubrication, etc. Moreover, Hiraki does not teach or suggest "ultrafine-grain natural diamond powder having a grading range of zero to 0.1 $\mu$ m."

Also, Sundback does not teach a process of sintering diamond without a sintering aid but it discusses sintering of CBN/diamond conjoint compacts. The reference describes at the cited portion as follows:

The present invention pertains to forming complexly shaped articles by freeze-forming a non-aqueous slurry of inorganic solids, generally ceramic

and/or metallic, by molding the slurry into a desired shape and then drying the frozen shape by non-destructive evaporation/sublimation to provide a green article with adequate green strength. The forming operation can be performed under low pressure and the green article can be conventionally sintered.

(Sundback, column 1, lines 17-24). According to Sundback, the inorganic solids are made into non-aqueous slurry. In contrast, the desilicated diamond powder is dispersed in aqueous solution according to the present invention. Sundback does not discuss ultrafine-grain natural diamond powder having a grain size of 0.1  $\mu\text{m}$  or less. The Examiner does not give the reason why a person having ordinary skill in the art would disperse desilicated ultrafine-grain natural diamond powder in aqueous solution rather than in non-aqueous solution as disclosed in Sundback.

Slutz describes at the cited portion as follows:

The manufacture of CBN by an HP/HT process is known in the art and is typified by the process described in U.S. Pat. No. 2,947,617, a basic monocrystalline CBN case. U.S. Pat. No. 4,188,194 describes a process for making sintered polycrystalline CBN compacts which utilizes pyrolytic hexagonal boron nitride (PBN) in the absence of any catalyst/sintering aid material.

(Slutz, column 1, lines 8-15). However, Slutz here discusses CBN or PBN but not diamond.

Slutz discusses diamond for example as follows:

The unsupported, sintered CBN/diamond conjoint compacts disclosed herein can be fabricated by subjecting a mixture of CBN or a CBN-forming material, and diamond particles in the substantial absence of catalyst/sintering aid material to HP/HT conditions for forming an unsupported sintered polycrystalline CBN compact characterized by CBN intercrystal bonding and containing diamond particles dispersed throughout the conjoint compact. Feed for forming the novel conjoint compacts includes PBN, monocrystalline and polycrystalline CBN, and boron rich polycrystalline CBN.

(Slutz, abstract, 2nd paragraph). Thus, diamond is discussed as a mixture with CBN or a CBN-forming material. Also, nothing in Slutz indicates sintering of ultrafine-grain natural diamond powder having a grain size of 0.1  $\mu\text{m}$  or less.

It is not clear in the Examiner's allegation how such disclosure is relevant to the present invention. Even if Slutz discloses sintered CBN/diamond conjoint compacts with substantial absence of catalyst/sintering aid material, a person having ordinary skill in the art would think that CBN or CBN-forming material would be necessary in order to sinter diamond.

The Examiner newly cited Yazu alleging that Yazu teaches producing a hard diamond sintered body in a sintering process using diamond powders in a reaction vessel made of Ta and without a sintering aid such as carbonate and that the product of Yazu has a Vickers hardness of 2000. The Vickers hardness of 2000 is not of the sintered diamond but that of alumina sintered body not of the sintered diamond body (see column 6, lines 37-38).

Moreover, according to Yazu, as shown in the embodiments, the diamond powder is of synthetic diamond and of the size 25-30  $\mu\text{m}$ , which is of far greater size than that used in the present invention. The diamond powder is graphitized before sintering. Thus, Yazu does not teach or suggest the steps recited in the present claims.

The Examiner also alleged as follows:

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Hiraki and Sundback with the process of Yazu because Yazu teaches a sintering process that is distinguishable from traditional sintering because the reaction vessel where the product is then more stable and is more heat resistant than diamonds produced in traditional sintering processes (col. 1, line 35-41; col. 2, lines 14-32; col. 4, lines 55-57).

Further, Slutz teaches that sintering the polycrystalline CBN/diamond conjoint compacts make the masses fully dense and thermally-stable (col. 2, lines 16-22).

It is not clear how “the reaction vessel where the product is then more stable and is more heat resistant than diamonds produced in traditional sintering processes” makes it obvious to combine Yazu with Hiraki, Sundback and Yazu.

Also, there is no reason that a person of ordinary skill in the art would combine or modify the teachings of Hiraki, Sundback, Sluts and Yazu. Even assuming, *arguendo*, that the teachings of these are combined, the present invention as recited in claim 1 is not obtained.

The MPEP 2143 explains that the key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in KSR noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. Thus, the rejection has not established a prima facie case of obviousness.

For at least these reasons, claims 3 and 4 patentably distinguish over Hiraki, Sundback, Slutz and Yazu.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants’ undersigned attorney to arrange for an interview to expedite the disposition of this case.

Application No.: 10/534,826  
Art Unit: 1793

Amendment under 37 CFR §1.116  
Attorney Docket No.: 052514

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,  
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